

SCOPE OF WORK FOR SIGNATURE MEASUREMENT, PREDICTION, AND ANALYSIS

1.0 Scope.

1.1 General. The Missile and Space Intelligence Center (MSIC) produces scientific and technical intelligence assessments of foreign surface-to-air missile systems, short-range ballistic missile systems, ballistic missile defense systems, antitank guided missiles, anti-satellite missiles, directed energy weapons, selected space programs/systems, and relevant command, control, communications, and computer systems. Signatures of foreign weapon systems are required by US weapons developers and warfighters to support detection, early warning, discrimination, tracking, engagement, and kill assessment efforts. In order to provide accurate, timely characterizations of global threat weapon systems, MSIC requires scientific and technical expert assistance to predict, measure, simulate and evaluate threat signatures in a wide variety of domains, including electromagnetic, optical, acoustic, seismic and magnetic.

1.2 Definitions.

1.2.1 MSIC Missile Systems. MSIC missile systems are those threat missile systems and Command, Control, Communications, and Computer (C4) equipment and related ground support equipment (GSE) that are the primary analytical responsibility of MSIC. These include short-range ballistic missile (SRBM) systems, surface-to-air missile (SAM) systems, directed energy weapon (DEW) systems, anti-ballistic missile (ABM) systems, direct-ascent anti-satellite (ASAT) systems, anti-tactical ballistic missile (ATBM) systems, land-based directed energy weapon systems used in air defense, ABM, or ATBM roles, and anti-tank guided missile (ATGM) systems as well as any other missile or weapon system that has been modified to operate in any of these roles.

1.2.1 All-Source Data. All-source data shall be interpreted as information that is specifically collected by intelligence means or that can be used to develop intelligence assessments. Sources include communications intelligence (COMINT), human sources intelligence (HUMINT), foreign instrumentation signals (FIS), imagery intelligence (IMINT), electronic intelligence (ELINT), measurement and signatures intelligence (MASINT), foreign materiel exploitation (FME) and other sources such as literature, periodicals, news, sales brochures, trade shows, military databases, parades, military exercises, expositions, patents, licenses, and symposia.

2.0 Applicable Documents. Applicable documents for this Statement of Work are delineated in the Document Summary List, (SEE Exhibit "A", DD Form 1423)

3.0 Requirements.

3.1 General. The required support is subdivided into four areas: (1) signature measurement; (2) signature prediction; (3) signature analysis; and (4) signature database development and maintenance.

3.2 Signature Measurement Support.

3.2.1 Model Fabrication. The contractor shall design and build physical scale models of MSIC missile systems, missile system components, missile support equipment, and other weapon systems based on available all-source data to use as threat representations for direct signature measurements. The contractor shall document the physical model development effort in a Technical Report (DI-MISC-80508B) and provide the physical model to the Government.

3.2.2 Signature Measurements. The contractor shall develop test plans, prepare test equipment, schedule and prepare test assets, conduct measurement tests, and analyze the results of signature measurements of MSIC threat systems components. Signature measurement efforts shall use actual system hardware or physical models of such hardware. Measured signature data shall include radio frequency (including radar cross section (RCS), synthetic aperture radar (SAR), and ground moving target indicator (GMTI) signatures), electro-optical, infrared, ultraviolet, visible, laser, acoustic, seismic and magnetic, as well as electromagnetic emanations. The frequency bands for the RCS measurements range from high frequency (HF) through and including millimeter wave (MMW). Appropriate spectral bands for other signature types will be specified by the Government. Signature measurements may be conducted in conjunction with use of camouflage, concealment, and deception techniques, as directed by the Government, in order to determine their effect on threat signatures. The contractor shall provide a technical report (DI-MISC-80508B) that describes the signature measurement equipment, test setup, calibration, measurement procedures and includes collected data as directed by the Government. Assessments based on measured signature data shall be entered into appropriate signature databases as specified by the Government.

3.2.3 Material Property Measurements. The contractor shall extract samples, catalog the samples, prepare test equipment, and measure material properties including, but not limited to, mechanical, chemical, thermophysical, optical, and electromagnetic. The contractor shall analyze and incorporate the results of such measurements, as specified by the Government, into material property databases utilized by the signature prediction models and codes. The contractor shall report procedures, results, and analyses of the material property measurement process using a format to be approved by the Government and provide the data in both hardcopy and electronic format (DI-MISC-80508B).

3.3 Signature Simulation and Validation. The contractor shall analyze all available data sources to develop models of MSIC threat missile system components and use these models and signature prediction codes to develop missile signature assessments.

3.3.1 Signature Code Acquisition and Development. The contractor shall acquire, design, develop, enhance, adapt and install signature generation and analysis software at MSIC to use to predict MSIC threat missile system component signatures. Acquisition and development shall be performed either at the contractor facility or at MSIC, at the direction of the Government. Certain signature simulation software shall be configured to operate on the MSIC High Performance Computing System (HPCS); other signature simulation software shall be configured to operate on MSIC's individual personal computers (PCs) or work stations. The determination of which software shall be configured for the HPCS and which will be configured for PCs or work stations will be specified by the Government. Analysis software shall include applications to predict radar cross section, infrared hard-body and exhaust plumes, laser, ultraviolet, optical, acoustic, seismic and magnetic signatures as well as electromagnetic emanations. The computer software and documentation acquired, designed, developed, enhanced, or adapted during this effort shall be provided to the Government (Software Product End Items – DI-MCCR-80700).

3.3.2 Computer-Aided Design Model Development. The contractor shall construct solid-body computer models and two-dimensional (2-D) line drawings for use in signature model development and signature calculation of missile systems and ground support equipment (GSE) signatures. Detailed computer-aided design (CAD) models of the equipment shall be developed and delivered IAW DI-MCCR-80700 and DI-MCCR-80019A. The CAD modeling program will be specified by the Government. When hardware is provided, the contractor shall use precise measurement techniques to capture small details such as gap width and depth and digital feature registration for incorporating and locating small features such as rivets and screw heads. The contractor shall model articulating parts to allow the model to be configured for the range of movement of the articulating parts and shall provide a configuration management software package with each model that allows the user to articulate moving parts and output the results for analysis. Measurements shall be in sufficient detail to support geometric model development and validation analyses for predicting signatures under a variety of tactical and environmental conditions.

3.3.3 Signature Calculations. The contractor shall use computer methods approved by MSIC to determine signatures of the MSIC missile systems; major components and subsystems; and ground support vehicles and equipment. The contractor shall perform some of these calculations on the MSIC HPCS. The contractor shall calculate narrow band and wideband RCS, SAR, GMTI, electro-optical, infrared, ultra-violet, visible, laser, acoustic, seismic and magnetic signatures for the missile and launch vehicle, the missile in flight, and combinations of other ground support equipment. The frequency bands for the RCS measurements range from high frequency (HF) through and including millimeter wave (MMW). Appropriate spectral bands for other signature types will be specified by the

Government. In-flight signatures shall consider components and events such as the hardbody, exhaust plume, airframe heating, guidance and control emanations, beacon and fuze emanations, debris, and command link signatures. Signatures shall be required over a wide range of geometries and frequencies (wavelengths) with and without countermeasures, camouflage, concealment, and deception techniques. The contractor shall analyze the simulated signature data and compare to measured data when available to establish a methodology for enhancing the signature simulation process (DI-MISC-80508B). The contractor shall perform special signature studies, such as variability and debris analyses, as specified by the Government (DI-MISC-80508B). The contractor shall provide analysis results and simulation software IAW DI-MISC-80508B and DI-MCCR-80700. When the contractor implements a new computer software simulation or modifies existing computer software, the contractor shall provide to the Government a Users Manual (Software Product End Items – DI-MCCR-80700). Assessments based on predictive signature analysis shall be entered into appropriate signature databases as specified by the Government.

3.4 Signature Exploitation and Analysis. The contractor shall analyze collected MASINT data on MSIC missile systems using established MSIC processes and approved tools. This data shall include missile signatures from launch events, collected ground vehicle signatures, and collected data from special projects. The contractor shall extract the data, post-process the data as appropriate, and perform detailed analysis that include comparative studies and model validation. The contractor shall report methodologies, assumptions, and analytic findings using a format to be approved by the Government and provide the data in both hardcopy and electronic format (DI-MISC-80508B).

3.5 Signature Database. The contractor shall scan and digitize hardcopy legacy signature data and enter that data into existing signature databases as directed by the Government. The contractor shall implement and maintain ORACLE-based signature databases that can be used to document results of signature measurements and predictions. The contractor shall enter current calculated and measured signatures into MSIC's signature database, the ORACLE-based MSIC Online Signature Tool (MOST), a Signature Support Program (SSP) node, or other databases as directed by the Government.

3.6 Miscellaneous Requirements.

3.6.1 Quick Response Tasking. The contractor shall perform quick response signature-related tasks as required to support MSIC's current intelligence program. These tasks shall include preparation of information papers, special purpose reports (DI-MISC-80652 which shall include, as appropriate, DI-DRPR-80651, DI-GDRQ-81223, DI-SAFT-81126, and DI-MISC-80738), briefings, fact sheets, and data packages; technical review of briefings, documents, and data packages for consistency with current analysis and assessments; and consultation.

3.6.2 Report Preparation. The contractor shall provide reporting in the form of digital files, both static and animated; perform technical writing, editing, report

formatting; prepare graphics and briefing aids; and integrate black and white or color photography into camera ready manuscripts. Digital formats, report formats, and templates will be provided by the Government. Soft copies of all resulting products shall be required. (DI-MISC-80508B and DI-MCCR-80700).

3.6.3 Methodology. The contractor shall specify in the delivery order proposals how they intend to respond to specific statements of work. Techniques may include systems analysis; technical literature research; physical and CAD modeling; simulations; and physical measurements.

3.6.4 Reporting Requirements. The contractor shall provide a Monthly Status Report (DI-MGMT-80793) and a Performance and Cost Report (DI-FNCL-80912) monthly on each effort performed under this requirement. The contractor shall provide formal In-Process Reviews (IPRs) as directed by the COR. The contractor shall provide a Program Review Agenda (contractor format) to the COR prior to each IPR. Cost, schedule and performance status and issues shall be presented at the IPRs (contractor format). Electronic and paper copies of the IPR presentations shall be provided to the COR as a record of the IPR.

3.6.5 Compatibility Requirements. All deliverables shall be prepared using MSIC-compatible systems and software. Contractor owned or subcontracted equipment may be used if compatibility is maintained.

3.6.6 Government Property. The Government, as appropriate, shall furnish equipment, software, access, and models needed by the contractor to perform a task. All models, software, data, and reports that are developed under a task shall be delivered by the contractor and become the property of the Government.